

IN THE CLAIMS:

Please cancel [✓]claims 1 to 76.

Please add claims 77 to 110 as follows:

A7 -- 77. A memory storing information including instructions, the instructions executable by a processor to operate a file system, the instructions comprising steps of:

responding to an incoming file server request by copying a descriptor of a file system change to both a first file server and a second file server;

processing said file system change at said first file server while maintaining said descriptor copy at said second file server; and

performing, at said second file server, a file system change in response to a copied descriptor and a service interruption by said first file server.

78. A memory as in claim 77, wherein the instructions further include steps of associating a first file server and a second file server with a mass storage element.

79. A memory as in claim 78, wherein the instructions further include steps of delaying output by at least one said file server to said mass storage system without delaying a response to file system changes.

80. A memory as in claim 78, wherein said mass storage element includes a file storage system and each said file server is disposed for leaving said file storage system in an internally consistent state after processing each said file system change.

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81. A memory as in claim 78, wherein said steps of performing a file system change in response to a copied descriptor are also operative in response to a service interruption by said second file server.

82. A memory as in claim 77, wherein a first said file server is disposed for processing said file system changes atomically, whereby a second said file server can on failover process exactly those file system changes not already processed by said first file server.

83. A memory as in claim 77, wherein a first said file server is disposed to respond identically to service interruptions for itself and for a second said file server.

84. A memory as in claim 77, wherein at least one said file server responds to a file system change before committing a result of said file system change to mass storage.

85. A memory as in claim 77, wherein
each said file server includes a file server change memory;

each one of said file servers is coupled to at least a portion of said file server change memory using local memory access; and

A7 each one of said file servers is coupled to at least a portion of said file server request memory using remote memory access.

86. A memory as in claim 85, wherein said file server change memory includes a disk block.

87. A memory as in claim 85, wherein said file server change memory includes a file server request.

88. A memory as in claim 85, wherein said file server change memory is disposed to delay output to a mass storage element without delaying a response to file server requests.

89. A memory as in claim 77, wherein said steps of processing includes steps of processing said file system change at both a primary mass storage element and a mirror mass storage element.

90. A memory storing information including instructions, the instructions executable by a processor to operate a file system, the instructions comprising steps of:

receiving a file server request at one of a plurality of file servers and in response thereto copying a descriptor of a file system change into a server change memory;

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processing said file system change for both a first set of mass storage devices coupled to a first one of said file servers and for at least one mass storage device in a second set of mass storage devices coupled to a second one of said file servers.

91. A memory as in claim 90, wherein said descriptor includes a file server request.

92. A memory as in claim 90, wherein said server change memory includes a disk block.

93. A memory as in claim 90, wherein said server change memory includes a file server request.

94. A memory as in claim 90, wherein said server change memory includes a first portion disposed at said first file server and a second portion disposed at said second file server.

95. A memory as in claim 90, wherein said server change memory includes a first portion disposed at said first file server and a second portion disposed at said second file

server; and wherein said steps of copying include steps of copying said descriptor into both said first portion and said second portion.

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96. A memory as in claim 90, wherein said server change memory includes a first portion disposed at said first file server and a second portion disposed at said second file server; and said steps of copying include steps of copying said descriptor into both said first portion and said second portion by either of said first file server or said second file server.

97. A memory as in claim 90, wherein said server change memory is disposed to delay output to said mass storage device without delaying a response to file server requests.

98. A memory as in claim 90, wherein
said steps of receiving include receiving a file server request at either said first file server or said second file server, and said steps of copying said descriptor include copying by either said first file server or said second file server; and wherein the instructions further include steps of

processing said file system change for both said second set of mass storage devices and for at least one mass storage device in said first set.

99. A memory storing information including instructions, the instructions executable by a processor to operate a file system, the instructions comprising steps of:

AM receiving a file server request at one of a plurality of file servers and in response thereto copying a descriptor of a file system change into a file server change memory; and responding to a service interruption by performing a file system change in response to a descriptor in said file server change memory.

100. A memory as in claim 99, wherein the instructions further include steps of associating said plurality of file servers with at least one mass storage element and at least one file server change memory.

101. A memory as in claim 100, wherein the instructions further include steps of leaving a file storage system on said mass storage element in an internally consistent state after processing each said file system change.

102. A memory as in claim 100, wherein the instructions further include steps of:

leaving a file storage system on said mass storage element in an internally consistent state after processing file system changes;

associating said internally consistent state with a set of completed file system changes; and

identifying said set of completed file system changes by at least one said file server.

103. A memory as in claim 99, wherein the instructions further include steps of delaying output to a mass storage element without delaying a response to file server requests.

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104. A memory as in claim 99, wherein the instructions further include steps of performing said received file server request at both a primary mass storage element and a mirror mass storage element.

105. A memory as in claim 99, wherein the instructions further include steps of: processing said file system changes atomically at a first said file server; and on failover processing exactly those file system changes not already processed by said first file server.

106. A memory as in claim 99, wherein the instructions further include steps of responding identically at a first said file server to service interruptions for itself and for a second said file server.

107. A memory as in claim 99, wherein said file server change memory includes a disk block.

108. A memory as in claim 99, wherein said file server change memory includes a file server request.

109. A memory as in claim 99, wherein said file server change memory is disposed to delay output to a mass storage element without delaying a response to file server requests.

110. A memory as in claim 99, wherein the instructions further include steps of responding to a file system change before committing a result of said file system change to mass storage at one of said file servers.--
